

FINAL DRAFT

Physical and Chemical Characteristics of the Shallow Groundwater Zone and Sources of Groundwater Contamination in the Vicinity of Kelly Air Force Base, Texas

Executive Summary

This report describes the physical and chemical characteristics of the shallow groundwater zone around Kelly Air Force Base (AFB) and differentiates two chlorinated volatile organic compound (CVOC) plumes found off base from the CVOC plumes that originate on Kelly AFB. The report shows that Kelly AFB is not the source of either the tetrachloroethene (PCE) plume found north of the base or the 1,1 dichloroethene (1,1 DCE) plume found north of East Kelly. Previous investigations conducted by Kelly AFB have suggested that there are other sources located off base that may be responsible for the shallow groundwater contamination found in these two areas. The Texas Natural Resource Conservation Commission (TNRCC) requested more information (see Appendix B); this report has been prepared in response to that request.

The shallow groundwater zone is a thin (3 to 15 feet), discontinuous, low-yield water-bearing unit that inherently has poor water quality; these natural factors limit the use of this resource as a commercial, municipal, or residential water source. The thick, clay-rich Navarro Formation underlies the shallow groundwater zone at depths of 20 to 50 feet. The topography of the Navarro Formation greatly influences the occurrence of groundwater and the movement of groundwater and contaminants. Widespread CVOC contamination from sources on and off Kelly AFB combined with high levels of naturally occurring minerals and anthropogenic substances inhibit the use of this water.

Extensive off-base groundwater investigations have delineated CVOC plumes originating from Kelly AFB to the point where contaminant concentrations found in the shallow groundwater zone are below typical regulatory criteria, such as the Safe Drinking Water Act's maximum contaminant level (MCL). However, it is important to note that off-base sources of CVOCs are present, and they have significantly contributed to the shallow groundwater problem. The PCE plume has concentrations high enough ($>1,500 \mu\text{g/L}$) to suggest that a PCE source is nearby and that it may be present as a dense non-aqueous phase liquid (DNAPL). The 1,1 DCE plume contains moderate to low concentrations ($<80 \mu\text{g/L}$) of 1,1 DCE and PCE. Both plumes extend several miles east and move towards the San Antonio River. Potential source areas that are unrelated to Kelly AFB have been identified at the upgradient ends of these two plumes.

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CVOC plume maps and other information on the hydrogeology and source locations have been used to identify areas where Kelly AFB has contributed significant amounts of CVOCs to the shallow groundwater zone. Outside these areas, the CVOC contamination has a non-Kelly-AFB source, with CVOC concentrations exceeding MCLs and little or no contributions from Kelly AFB sources. The northern boundary of the off-base contamination has not been delineated down to MCLs. At this time, Kelly AFB does not intend to address CVOC contamination with a non-Kelly source unless new information suggests that Kelly AFB is likely to be responsible for a significant portion of the contamination.

Effective remediation requires identifying and either removing or controlling all significant sources of contamination, including natural or anthropogenic contaminants, from Kelly AFB and off-base sources. Kelly AFB has already identified all significant on-base sources that contribute to off-base groundwater contamination, and remedial systems are (1) in place and operating, (2) under construction, or (3) being planned. Although removal of all Kelly-AFB-derived CVOCs from the shallow groundwater will improve water quality, such actions will not change the fact that this groundwater is inherently a poor-quality and low-value resource that will continue to be impacted by releases from sewers and other non-Kelly commercial and industrial operations. Removal or containment of CVOC sources (on- and off-base) and control of the highest CVOC groundwater concentrations would appear to be a reasonable approach. The limited value of the shallow groundwater resource should be considered when selecting a remedial action.